1. **Course Information:**
   Course: EMSE 6450.10 – Quantitative Methods in Investment Engineering  
   Semester: Spring 2020  
   Meeting Time: Wednesdays from 6:10PM to 8:40PM  
   Location: Tompkins Hall Computer Lab 405

2. **Instructor and Contact Information:**
   Name: J. René van Dorp, Professor  
   Campus Address: 800 22nd Street, Office 2800, Washington DC 20052  
   Phone: 202-994-6638  
   E-mail: dorpjr@gmail.com  
   Office hours: Monday 2:00PM to 4:00PM

3. **Course Description:**
   Cash flow streams and the basic theory of interest; bond pricing and immunization of bond portfolios, the term structure of interest rates, mean-variance portfolio theory and the capital asset pricing model; value at risk. Recommended background: Technical background at the level of a bachelor’s degree in engineering, mathematics, or science and working knowledge of Microsoft Excel.

4. **Prerequisite Requirement(s) or Approval of Instructor:**
   **APSC 3115** (or **EMSE 6115**): Engineering Analysis III (or any other undergraduate Applied Statistics course from a physical or natural sciences program).  
   [http://www.seas.gwu.edu/~dorpjr/APSC3115/Intro.html](http://www.seas.gwu.edu/~dorpjr/APSC3115/Intro.html)

   **EMSE 6410:** Survey of Finance and Engineering Economics: Survey of material relevant to financial decision making for engineering activity. Includes traditional engineering economy topics; fundamentals of accounting; and financial planning, budgeting, and estimating applicable to the management of technical organizations.

5. **Required Materials:**
   b. Electronic Lectures notes available at:  
      [http://www2.seas.gwu.edu/~dorpjr/EMSE4765/Coursefiles.html](http://www2.seas.gwu.edu/~dorpjr/EMSE4765/Coursefiles.html)
   c. MS Excel Software
6. **Learning Outcomes**
As a result of completing this course, students will be able to:

a. Price fixed income securities such as annuities and bonds and evaluate price sensitivity of bonds as a result of market interest rate changes.

b. Construct a portfolio of bonds that is immunized against interest rate changes.

c. Understand and apply more advanced interest rate theory to the above three topics using the term structure of interest.

d. Perform applied interest rate analysis in a deterministic setting.

e. Construct an efficient frontier from a series of stocks using Markowitz Portfolio Theory.

f. Combine a Markowitz Stock Portfolio with a risk free asset to construct the capital market line and understand its connection to the Capital Asset Pricing Model.

g. Construct a Markowitz Portfolio avoiding short-selling of stocks to achieve a desired return.

h. Articulate topics 6-8 in a investment analysis final report of 10 stocks prices of a student’s choice.

7. **Attendance**
Regular class attendance is strongly encouraged. You will be held responsible for all the class discussions as well as the reading assignments. Here is the university policy: [https://registrar.gwu.edu/university-policies#attendance](https://registrar.gwu.edu/university-policies#attendance)

8. **Independent Learning**
In a 15-week semester, including exam week, students are expected to spend a minimum of 100 minutes of out-of-class work for every 50 minutes of direct instruction, for a minimum total of 2.5 hours a week. A 3-credit course should include 2.5 hours of direct instruction and a minimum of 5 hours of independent learning or a total minimum of 7.5 hours per week. More information about GW's credit hour policy can be found at: [https://provost.gwu.edu/policies-procedures-and-guidelines](https://provost.gwu.edu/policies-procedures-and-guidelines) and click on Assignments of Credit Hour Policy (PDF), Or see the PDF pages (webpage); [https://provost.gwu.edu/files/downloads/Resources/Assignment-of-Credit-Hours_Final_Oct-2016.pdf](https://provost.gwu.edu/files/downloads/Resources/Assignment-of-Credit-Hours_Final_Oct-2016.pdf)

9. **Method of Instruction:**
One hour and 20 minutes lecture including homework discussion, followed by a 10 minute break and a one hour lecture. Microsoft Excel is used to perform analysis during the class sessions and the homework. During class sessions the only software programs that should be open on your desktop are either Adobe Acrobat (for viewing the notes) or Microsoft Excel for investment analysis. **Reading assignments will have to be completed before class. Homework will have to be completed and handed-in accordance to the outline schedule one class after it was assigned and before the class starts.** During the class sessions (except for the break of course) a student is not to check his e-mail, the internet and should not engage in instant messaging sessions. Basically, your attention should be directed towards the class material.
10. **Homework Grading Policy:**
Homework sets consisting of multiple homework problems will have to be completed prior to the next class for discussion and **uploaded through Blackboard**. A student may be called upon to discuss their solution for each homework problem in a homework set, so you must be prepared! The rest of the class should be involved in the discussion. Your level of effort will be graded. Not handing in a solution for a homework problem will result in **0 points**. Homework problems that are handed in on time AND demonstrate an adequate level of effort will typically be awarded **1 point**. Partial points can be awarded for homework problems in a homework set. At times a larger homework problem may be awarded a number of effort points **larger than 1**, which will be indicated. Homework sets that are handed in one day late receive a maximum of 50% of the assigned homework credit. Homework sets that are handed in more than one day late will not be awarded any credit.

11. **Midterm Exam and Final Reports:**
Students will complete an in-class Midterm Exam using Microsoft Excel (using a lab computer or the student's laptop). Theoretical questions will be answered in an exam booklet. The MS EXCEL file and the exam booklet will be part of the grading of the midterm exam. Students will be required to download stock prices of 10 stocks and use those datasets to create an efficient frontier and develop and investment stock portfolio from this efficient frontier that avoids short selling but with a desired return. Student will write a final report detailing their investment analysis steps, final analysis results and investment recommendation. **Students are required to submit the electronic files associated with the final reports through blackboard** as well as a **hard copy of the final report** that will be graded. **Students are required to work on their own to perform their investment analysis using their chosen stock data sets and write the final report on their own**.

12. **Grading:**
5% - Class Attendance
20% - Homework (graded on effort only)
35% - Midterm Exam (In-Class)
40% - Markowitz Portfolio Construction + Final Report

13. **Homework Set and Reading Assignments:**
Homework sets, Lecture notes and recommended chapters for reading will be assigned prior to class as indicated in the outline below.
### Class Schedule: Subject to change, please check the schedule regularly

<table>
<thead>
<tr>
<th>Session</th>
<th>Date</th>
<th>Class Topic</th>
<th>Reading Assignments 2n Ed. (LN = Lecture Notes)</th>
<th>Homework Assignments 2nd Edition Numbering</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/15/2020</td>
<td>Cash Flow Streams and the Basic Theory of Interest</td>
<td>Chapters 1 - 2</td>
<td>Homework Set 1</td>
</tr>
<tr>
<td>2</td>
<td>1/22/2020</td>
<td>Fixed Income Securities - Part 1</td>
<td>Chapter 3</td>
<td>Homework Set 2</td>
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<tr>
<td>3</td>
<td>1/29/2020</td>
<td>Fixed Income Securities - Part 2</td>
<td>Chapter 3</td>
<td>Homework Set 3</td>
</tr>
<tr>
<td>4</td>
<td>2/5/2020</td>
<td>The Term Structure of Interest Rates</td>
<td>Chapter 4</td>
<td>Homework Set 4</td>
</tr>
<tr>
<td>5</td>
<td>2/12/2020</td>
<td>Applied Interest Rate Analysis - Part 1</td>
<td>Chapter 5</td>
<td>Homework Set 5</td>
</tr>
<tr>
<td>6</td>
<td>2/19/2020</td>
<td>Applied Interest Rate Analysis - Part 2</td>
<td>Chapter 5</td>
<td>Homework Set 6</td>
</tr>
<tr>
<td>7</td>
<td>2/25/2020</td>
<td>Midterm Review</td>
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<tr>
<td>8</td>
<td>3/4/2020</td>
<td>Exam 1 - Session 1 - 6</td>
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<tr>
<td>9</td>
<td>3/11/2020</td>
<td>Mean-Variance Portfolio Theory - Part 1</td>
<td>Chapter 6, Appendix A and B</td>
<td>Homework Set 7</td>
</tr>
<tr>
<td>10</td>
<td>3/18/2020</td>
<td>SPRING BREAK</td>
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<tr>
<td>11</td>
<td>3/25/2020</td>
<td>Mean-Variance Portfolio Theory - Part 2</td>
<td>Chapter 6, Appendix A and B</td>
<td>Homework Set 8</td>
</tr>
<tr>
<td>12</td>
<td>4/1/2020</td>
<td>Mean-Variance Portfolio Theory - Part 3</td>
<td>Chapter 6, Appendix A and B</td>
<td>Homework Set 9</td>
</tr>
<tr>
<td>13</td>
<td>4/8/2020</td>
<td>FINAL PROJECT PART I - Building a Markowitz Efficient Frontier with only Risky Funds and the Capital Asset Pricing Model</td>
<td>Chapter 7</td>
<td>Homework Set 10</td>
</tr>
<tr>
<td>14</td>
<td>4/15/2020</td>
<td>Data and Statistics, FINAL PROJECT PART II</td>
<td>Chapter 9, 2nd Edition</td>
<td>Homework Set 11</td>
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<tr>
<td>16</td>
<td>5/13/2020</td>
<td>FINAL REPORT DUE ON FINAL PROJECT</td>
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</tr>
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</table>
14. **Academic integrity:**
Academic integrity is central to the learning and teaching process. Students are expected to conduct themselves in a manner that will contribute to the maintenance of academic integrity by making all reasonable efforts to prevent the occurrence of academic dishonesty. Academic dishonesty includes, but is not limited to, obtaining or giving aid on an examination, having unauthorized prior knowledge of an examination, doing work for another student, and plagiarism of all types. Ignorance is no excuse.

The number one problem that students run into with regards to academic integrity is plagiarism. It is not okay to copy, use, or otherwise exploit other people’s ideas, words, or creations without giving them credit in the proper form. Sometimes this means you must use quotation marks; while other times a simple source citation will do the trick. Changing a few words in a paraphrase is not enough to turn source material into “your own words” – in fact, that’s a really bad idea to even try. Changing the phrasing order of sentences is not okay and using the thesaurus to find ways to change “happy” to “glad” is also a very bad idea. It is expected that students know how to correctly quote and cite material, and also how to write well. For those students who need assistance, the GWU Writing Center is available. Please see: [https://writingcenter.gwu.edu/](https://writingcenter.gwu.edu/)

**Academic Integrity Code:**
Academic dishonesty is defined as cheating of any kind, including misrepresenting one’s own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information. For the remainder of the code, see: [https://studentconduct.gwu.edu/code-academic-integrity](https://studentconduct.gwu.edu/code-academic-integrity)

15. **What to do if the instructor does not arrive:**
If the Instructor does not arrive for the class at the designated starting time and has not notified the class of a late starting time or the cancellation of the class, the students should wait in the classroom for at least 30 minutes before departing. One member of the class should be selected to notify the EMSE Department of the Instructor’s absence by calling the EMSE Department 202-994-4892 on next business day.

16. **University Policy on Religious Holidays:**
In accordance with University Policy,

- Students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance.
- Faculty should extend to these students the courtesy of absence without penalty on such occasions, including permission to make up examinations.
- Faculty who intend to observe a religious holiday should arrange at the beginning of the semester to reschedule missed classes or to make other provisions for their course-related activities. For more details and policy and accommodations for religious holidays please see: [https://students.gwu.edu/accommodations-religious-holidays](https://students.gwu.edu/accommodations-religious-holidays)
17. Support for Students Outside the Classroom:

**Disability Support Services (DSS):**
Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Rome Hall, Suite 102, to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to: [https://disabilitysupport.gwu.edu/](https://disabilitysupport.gwu.edu/)

**Mental Health Services:**
**Colonial Health Services: 202-994-5300 (24Hours/7Days).**
The University’s Mental Health Service offers 24/7 assistance and referral to address students’ personal, social, career, and study skills problems. Services for students include: crisis and emergency mental health consultations, confidential assessment, counseling services (individual and small group), and referrals: [https://healthcenter.gwu.edu/mental-health](https://healthcenter.gwu.edu/mental-health)

18. Security and Safety Policy:
**GW Campus Advisories; Students should check the GW Campus Advisories Web Site at:** [https://campusadvisories.gwu.edu/](https://campusadvisories.gwu.edu/) for current information related to campus conditions, closures, safety information and any other information concerning events that may disrupt normal operations. Life-Threatening Emergencies On Campus: Call GWPD at 202-994-6111

**GW Alert Notifications:**
GW Campus Advisories. Students should check the GW Campus Advisories Web Site at: [http://www.campusadvisories.gwu.edu/index.cfm](http://www.campusadvisories.gwu.edu/index.cfm) for current information related to campus conditions, closures, safety information and any other information concerning events that may disrupt normal operations. All students, faculty and staff registered in the GW banner system GW will receive emergency alerts, notifications and updates sent directly to their GW email address. If individuals elect to receive these alerts on a mobile device they may logon to GWeb Information Web Site at: [https://banweb.gwu.edu/](https://banweb.gwu.edu/) and update their contact information to include mobile devices.